

REMARKS

Claims 5-7, 10-11, 13-35, 43-51 and 55-78 are pending in the application. Independent claims 5, 14, 43, 44 and 55 are amended by the present amendment.

Claims 5-7, 10-11, 13-35, 43-51 and 55-78 are rejected as unpatentable over TOMITA 5,990,477 in view of TOMITA et al. 6,257,053 and further in view of ADDERTON et al. 6,172,506 and further in view of WILLIAMS et al. 6,210,982.

Reconsideration and withdrawal of the rejection are respectfully requested because the proposed combination of references does not teach or suggest a single piezoelectric element electrically isolated from a probe body and in the proximity thereof that is structured and arranged to vibrate a sharp end of the probe body along a direction approximately in parallel with the surface of a sample as recited in claim 5. In addition, the proposed combination of references does not teach or suggest a detector, coupled to the single piezoelectric element, structured and arranged to detect a vibration state of the probe in response to a difference in phase between a vibration frequency of the single piezoelectric element and a frequency of the probe as further recited in claim 5 of the present application.

By way of example, Figure 3 of the present application shows a single piezoelectric element 4. The single piezoelectric element 4 is electrically isolated from the body of probe 3 and

is in the proximity thereof as disclosed on page 6, lines 16-18 of the present application. As further seen in Figure 3, a detector 6 is coupled to the single piezoelectric element 4. As disclosed on page 6, lines 24-29, detector 6 detects a vibration state of the conductive probe in response to a difference in phase between the vibration frequency of the single piezoelectric element 4 and a frequency of the probe 3.

Neither ADDERTON et al. nor WILLIAMS et al. are offered for the above features and in fact do not teach or suggest such features. TOMITA is offered for the teaching of a piezoelectric oscillator 2, a quartz oscillator 4 and a probe 1. As noted in the Official Action, TOMITA does not teach or suggest that the probe is electrically isolated from a piezoelectric vibrating unit. In an attempt to overcome the shortcoming, TOMITA is combined with TOMITA et al.

TOMITA et al. teach a probe 1 and an oscillation section formed by an oscillating piezoelectric element 2 and a detecting piezoelectric element 3. The position set forth in the Official Action is that probe 1 of TOMITA et al. is attached to detecting piezoelectric member 3. Since the piezoelectric member 3 and the piezoelectric member 2 are electrically isolated, then the probe is also electrically isolated from the vibrating piezoelectric member 2. The Official Action further states that such structure is equivalent to a vibrating piezoelectric element electrically isolated from the probe.

However, the position set forth in the Official Action is untenable for at least the following reasons. TOMITA et al. teach detecting piezoelectric member 3 and oscillating piezoelectric member 2. The Official Action has equated these two elements as equivalent to a single piezoelectric element electrically isolated from the body and in the proximity thereof as recited in claim 5 of the present application.

Column 4, lines 4-13 of TOMITA et al. disclose that detecting piezoelectric element 3 is pressed against probe 1 at contact portion 3a so that the probe 1 is stably joined to the detecting piezoelectric member 3. Since the detecting piezoelectric member 3 is in direct contact with the probe, detecting piezoelectric member 3 is not electrically isolated from the probe 1. As set forth above, TOMITA does not disclose or suggest this feature and ADDERTON et al. and WILLIAMS et al. are not offered for this feature and also do not disclose or suggest this feature.

In addition, claim 5 is directed to a single piezoelectric element. TOMITA teaches quartz oscillator 4 and piezoelectric vibrating unit 2. The quartz oscillator 4 is part of the oscillation section and the quartz oscillator would also be considered a piezoelectric element. Therefore, TOMITA teaches two piezoelectric elements 2 and 4, not a single piezoelectric element. TOMITA et al. also teach an oscillation section formed by a piezoelectric member 2 and a detecting piezoelectric element

3. TOMITA et al. do not teach or suggest a single piezoelectric element.

Further, since the detector of the present application is coupled to a single piezoelectric element and is structured and arranged to detect a vibration state of the probe in response to a difference in phase between the vibration frequency of the single piezoelectric element and the frequency of the probe, there is no need for an additional piezoelectric element such as the piezoelectric detector 3 in TOMITA et al. or the quartz oscillator 4 in TOMITA which possibly introduce errors in the detecting function. Therefore, the detecting function of the detector as recited in claim 5 is improved over that of the cited prior art.

Accordingly, the single piezoelectric element 4 of the present application serves as a means for detecting the frequency of the probe as well as a means for vibrating the probe as disclosed on page 6, lines 14-29 of the present application.

By way of further explanation, if a piezoelectric element is electrically attached to the probe as the detecting element such as piezoelectric member 3 of TOMITA et al., the probe oscillation induces a considerable change in the capacitance of the piezoelectric element, thus inviting a parasitic capacitance change which is detected by capacitance sensor at a frequency of the probe oscillation. This parasitic capacitance is harmful in detecting a desired capacitance change

dC/dX along the sample surface, since dC/dX has the same frequency of the probe oscillation.

In addition, if an electrical potential of the probe is changed for the dC/dV measurement, the piezoelectric element may oscillate at the frequency of the potential change which substantially kicks back to the oscillation.

In contrast, when a single piezoelectric element as recited in claim 5 is electrically isolated from the probe, dC/dV and dC/dX can be simultaneously detected. Accordingly, if a sample is formed by a semiconductor device, information regarding the concentration of majority carriers in equilibrium and the concentration of ionized dopants can easily be obtained, as set forth on page 20, lines 4-7 of the present application.

In view of the foregoing remarks, it is believed that claim 5 has been placed in condition for allowance. Claims 6, 7, 10, 11 and 13 depend from claim 5 and further define the invention and are also believed patentable over the proposed combination of references.

Independent claims 14, 43, 44 and 55 include similar recitations to those of claim 5. The comments above regarding claim 5 are equally applicable to claims 14, 43, 44 and 55.

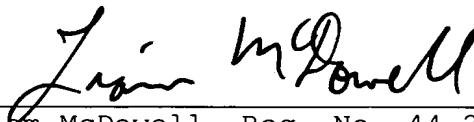
Claims 15-35, 45-51 and 56-78 depend from one of claims 14, 43, 44 or 55 and further define the invention and are also believed patentable over the cited prior art.

In view of the present amendment and the foregoing remarks, it is believed that the present application has been placed in condition for allowance. Reconsideration and allowance are respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

YOUNG & THOMPSON



Liam McDowell, Reg. No. 44,231
745 South 23rd Street
Arlington, VA 22202
Telephone (703) 521-2297
Telefax (703) 685-0573
(703) 979-4709

LM/lk